REMARKS

Amendments

Claim 1 has been amended by incorporating the terms of claims 2 and 11.

Claim 2 limits the elongate members to a rod and tube, and this has been further delimited dimensionally by reference to the paragraph of the specification bridging pages 6 and 7, the length requirements being set out in the first complete paragraph on page 6.

Claim 11 calls for a region of striations. Actually, this means striations between clear areas of the surface of the elongate transparent member and this has been added (see last complete paragraph on page 6 of the specification). Furthermore, the limitation that the translucent second elongate member "render(s) the striations invisible so that substantially uniform illumination is created" (see page 7, third complete paragraph) has also been added, along with "the number and kind of striations with respect to the clear areas being selected to maximize light output", (again, see last complete paragraph on page 6 of the specification).

The feature that the second elongate member is "not transparent material" has been deleted, since the examiner is correct that if it is translucent, as required, it is not transparent, which is thus a redundant requirement.

Accordingly, no new matter has been added.

Claim Rejections - 35 USC § 103(a)

The Examiner rejects claims 1-4, 6, 7, 9 and 10 under 35 USC §103(a) as being unpatentable over Thompson (US 4,561,043) in view of Hulse (US 6,550,952).

Claims 2 and 7 have been cancelled.

Thompson describes a decorative light display that comprises a transparent rod coupled to a light source, wherein the rod comprises one or more exit windows which are etched portions of the rod that allows the light to exit the rod. In one embodiment, the Thompson arrangement comprises a tube in which the rod is disposed, where the tube may be transparent or translucent.

The Examiner asserts that Thompson teaches all of the features of claim 1 except for the following three features: 1) the elongate member (16) is transparent; 2) the light source as an

LED; or 3) the gas space is about 2 mm. The Examiner considers each of these features to be disclosed in Hulse, and further considers that one of ordinary skill in the art would find it obvious to incorporate these features into the Thompson device and arrive at the presently claimed invention.

Claim 1 has been amended by incorporating the feature of previous claim 11, namely that "the transparent member has a surface formation comprising at least one region of striation on the surface of the elongate transparent member so that it is adapted, in use, to function as a leaky wave guide". Thompson teaches windows having etched surfaces where the windows provide visible patches of light along the rod for decorative purposes. It specifically teaches the undesirability of prior arrangements where "no attempt is made to selectively provide windows or other exiting points for light rays" (column 1, lines 23-24). A uniform illumination is not desired.

Claims 8, 14 and 15 stand rejected under 35 USC §103(a) as unpatentable over Thompson modified by Hulse et al in view Sugiyama et al (US 5,982,969).

Claims 8, 14 and 15 have been cancelled.

The Examiner rejects claims 11 and 16 under 35 USC §103(a) as being unpatentable over Thompson modified by Hulse in view of Oyama (US 5,233,679).

Claim 11 has been cancelled.

Regarding claim 16, the Examiner finds that Thompson as modified by Hulse and Oyama teaches a plurality of striations cut in the surface of the first translucent member; the V-shaped striations thus created extend at least substantially throughout the length of the first member and are spaced apart around at least a part of the extent of the surface of the first member.

Although Thompson, modified by Hulse and Oyama, fails to explicitly suggest the depth and width of the striations, it would have been obvious to one of ordinary skill in the art to cut the grooves between 2.5 and 1 mm in size, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum range involves only routine skill (In re Aller, 105 USPQ 233). One skilled in the art would be motivated to select the size of the striation in order to optimize the diffusion and light emitting effects for the translucent first member.

Oyama teaches a translucent member (10) which is illuminated by a light source (20) through the end (28). The translucent member is either an optic fiber (14) of about 1 mm diameter or a panel (40). Oyama suggests that uniform light issues from the fiber. However, this cannot be the case in respect of the panel. Claim 1 now requires that the striations are rendered invisible by covering with the translucent tube. The result is shown below (Figure 1) which are six devices in accordance with the present invention.

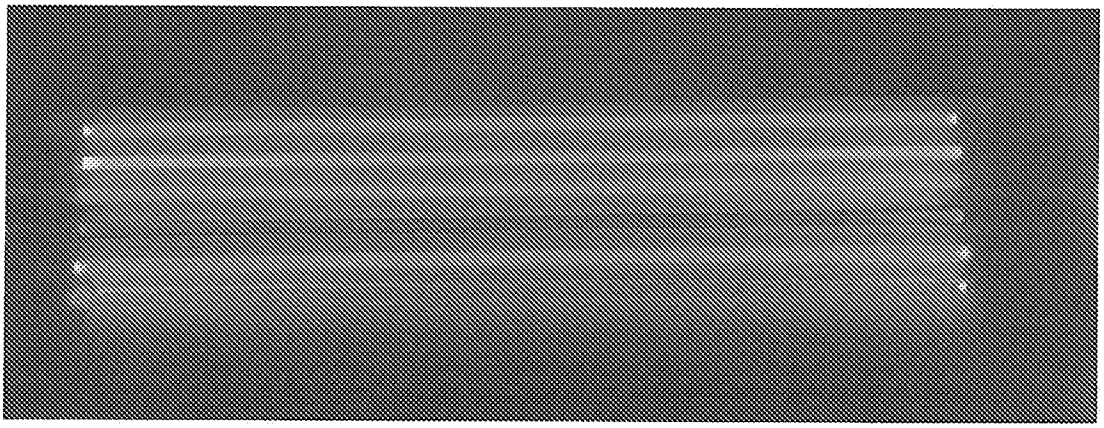


Figure 1

Note that in the figure the tubes are lit with nominal 1 watt high brightness LEDs located at each of the device; tube external diameter = 30 mm; striated rod diameter = 20 mm). The present invention suggests the tubular second elongate member which is translucent so that it acts as a diffuser to scatter light emanating from the rod. The following facts should be understood:

- The diffuser tube re-radiates the 'collected' light in a lambertian manner to help create a uniformly luminant device regardless of viewing angle; the tube must be present and cannot be transparent (as the lambertian scattering property is essential.)
- The diffuser tube must be diffuse in terms of opacity such that the observer does not view the internal tube in the rod and its surface scratches (they are rendered invisible)
- The diffuse tube serves to function as the source 'object plane' for the observer who forms a real inverted image of the (illuminated) tube on their retina.

- The diffuser collects all the light emitted from the waveguide (regardless of the scattering mechanism whether it be volumetric or surface) and re-radiates the light in the desired lambertian manner.
- Coloration of the tube allows for a colored luminant device to be created (as shown in Fig. 1 above); this may be enhanced by using LEDs of matching saturated color
- A white diffusing tube creates a uniformly luminant white light source; incorporation of color changing LEDS at the rod ends thereby yields a luminant device whose color can be changed

Claim 12 stands rejected under 35 USC §103(a) as unpatentable over Thompson modified by Hulse and Oyama and further in view of Yamamoto et al (US 6,601,984).

Claim 12, as currently amended, depends directly from amended claim 1 and is believed to be allowable therewith.

Claim 13 stands rejected under 35 USC §103(a) as unpatentable over Thompson modified by Hulse and further in view of Strack et al (US 3,901,674). As with claim 12, claim 13 depends directly from claim 1 and is therefore believed to be allowable therewith.

Claim 17 stands rejected under 35 USC §103(a) as unpatentable over Thompson modified by Hulse et al, Oyama and Yamamoto, and further in view of Kuo (US Pat. Pub. 2004/0075994).

Claim 17 depends from claim 12 and is believed to be allowable therewith by virtue of its dependency from claim 1.

Waveguide with Weak Scattering

The outstanding issue is how to create the desired weakly scattering waveguide rod ('optical waveguide') with the appropriate scattering properties of a long mean free path? It follows that there are two approaches:

a) Weak Volumetric scattering within the volume if the rod

b) Weak surface scattering along the length of the rod

Volumetric scattering may be an intrinsic property of the optical materials and may itself lead to a degree of 'forward scattering' occurring in the device. In this case, the close location of the external diffusing tube serves to capture the forward scattered light and re-converts to light that is scattered in the desired lambertian manner[1,2]. Note that such a material may be hard to identify and costly to manufacture. Hence a means to convert a rod to have desired weakly scattering properties is described in the patent application.

Weak surface scattering is described in the patent application by the application of longitudinal scratches to the outer surface of the rod – this can create the appropriate mix of total internal reflections (between the scratches) and scattering incidents (at the scratches) such that the mean free path for scattering (i.e. probability of a scattering event) is reasonably large e.g. of the order of the rod length.

The mechanism for this is shown schematically in the following figure:

[1] Applicant's prior response filed on September 2, 2010, that discussed the "forward diffusion" from the surface of the rod that is not at all likely to be normal to the rod axis but closer to parallel the rod axis, is still very pertinent. That is to say, between the striations, the rod is still a weakly leaky waveguide from which light escapes and this can only be captured by the translucent closely proximate diffuser tube. That tube therefore serves the dual purpose of hiding the scratches and other imperfections on the surface of the tube as well as capturing and re-radiating in Lambertian manner (see below for Wikipedia definite of Lambertian reflectance, which has the same meaning with regard to refraction) light leaking at a narrow angle from between the striations.

[2] "If a surface exhibits Lambertian reflectance, light falling on its is scattered such that the apparent brightness of the surface to an observer is the same regardless of the observer's angle of view. More technically, the surface luminance is isotropic. For example, unfinished wood exhibits roughly Lambertian reflectance, but wood finishing with a glossy coat of polyurethane does not, since specular highlights may appear at different locations on the surface. Not all rough surfaces are perfect Lambertian reflectors, but this is often a good approximation when the characteristics of the surface are unknown. Lambertian reflectance is named after Johann Heinrich Lambert."

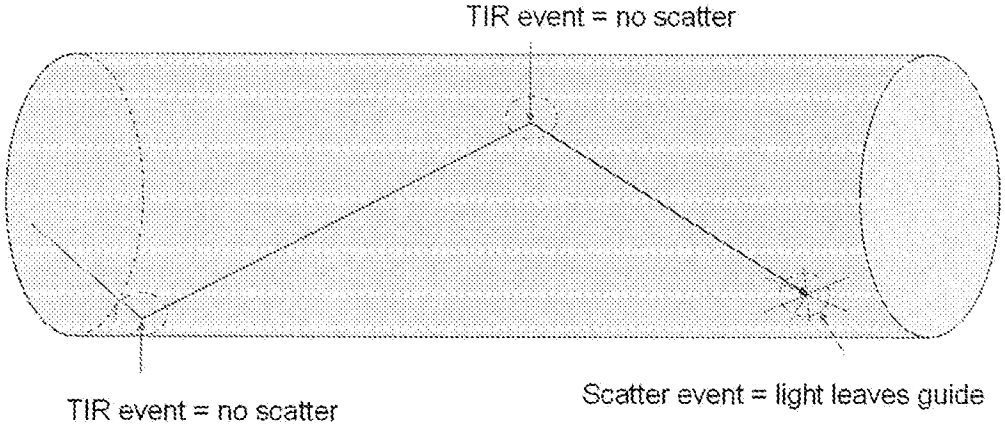


Figure 2: Schematic of Striated Rod In Tube

It can be understood that the spatial density of the scratches around the rod can be set to determine the appropriate scattering properties; too low a spatial density implies too little light is scattered from the guide; too high a spatial density and light is scattered 'too quickly' i.e. too close to the light source.

The following figures show close ups of the striated rod in tube system:

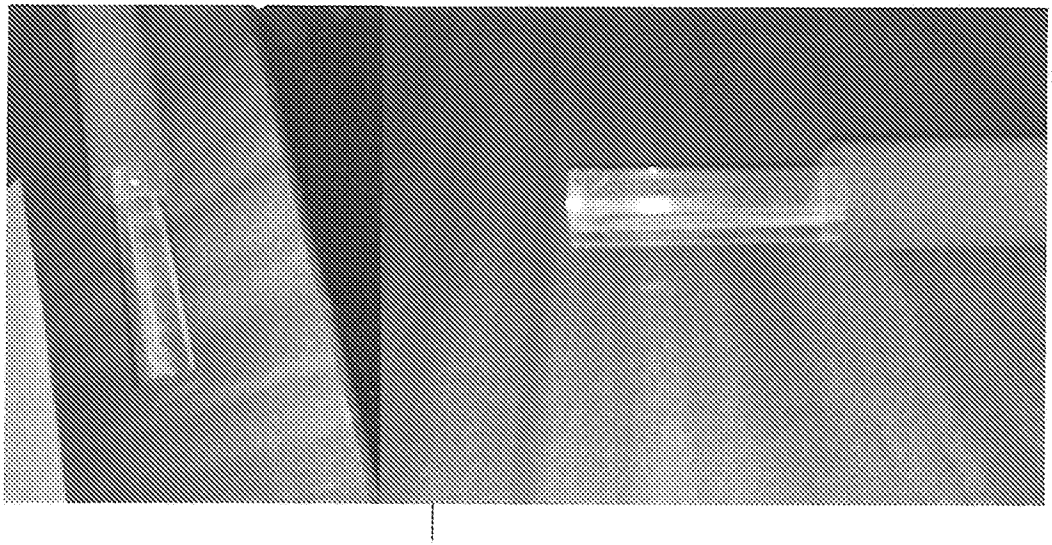


Figure 3: Striated Rod In Tube Optical Device

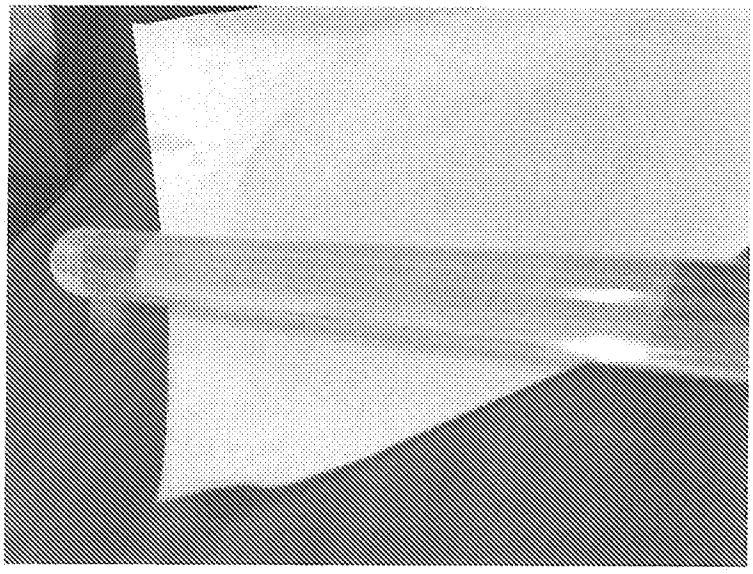


Figure 4: Striated Rod – Showing Scratches

Consequently, the applicant respectfully concludes that the Examiner is not correct with regard to claim 11, as it was, and certainly with respect to claim 1 as presently worded. Claim 1 is not, it is respectfully suggested obvious in light of Thompson and Hulse in view of Oyama.

Thus to achieve the present invention, it is necessary for the skilled person to first to change the windows of Thompson with the striations of Oyama, which is completely the opposite of what Thompson teaches in making windows of light as attractive features of the device compared with Oyama that teaches uniform light emission. Indeed, the skilled person must go still further from Thompson, since the striations of Oyama may still be visible, by enclosing the rod, not in the transparent tube taught by Hulse, but a translucent tube that renders invisible the very features that Thompson (and Hulse) want to emphasize.

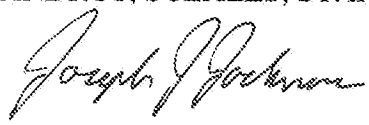
A prior art "reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." (In re Gurley, 27 F.3rd 551, 555 (Fed. Cir. 1994). In addition, the fact "that the inventor achieved the claimed invention by doing what those skilled in the suggested should not be done is a fact strongly

probative of non-obviousness." Kloster Speedsteel AB v. Crucible, Inc., 793 F.2d 1565, 230 USPQ 81 (Fed. Cir. 1986)).

For all of the foregoing reasons, claims 1, 3-4 and 6, 9, 10, 12, 13, 16 and 17 are believed to be allowable and further favorable action is respectfully requested.

Respectfully submitted,

ANDRUS, SCEALES, STARKE & SAWALL, LLP



Joseph J. Jochman
Reg. No. 25,058

100 East Wisconsin Avenue, Suite 1100
Milwaukee, Wisconsin 53202
Telephone No. (414) 271-7590
Attorney Docket No.: 5297-00001